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U S NAVY RESPONSE TO COMMENTS ON REDLINE DRAFT FINAL FEASIBILITY STUDY REPORT SITE 12 WITH TRANSMITTAL NS NEWPORT RI
4/26/2013
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C-NAVY-04-13-5213W

April 26, 2013

Ms. Kymberlee Keckler
United States Environmental Protection Agency Region I
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3912

Ms. Pamela Crump
Office of Waste Management
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, Rhode Island 02908-5767

Reference: CLEAN Contract No. N62470-08-D-1001
Contract Task Order WE58

Subject: Redline Draft Final FS Report
DU4-1; Site 12 (Tank Farm 4),
Naval Station Newport, Newport Rhode Island

Dear Ms. Keckler and Ms. Crump:

On behalf of Mr. Roberto Pagtalunan, US Navy NAVFAC, I am providing to you responses to comments on the redline Draft Final Feasibility Study Report for DU 4-1 at Site 12 (Tank Farm 4) which is Operable Unit (OU) 11 for Naval Station (NAVSTA) Newport (formerly Naval Education and Training Center (NETC) Newport). Electronic copies of this submittal will be provided by electronic mail to those on the distribution list below.

The redline Draft Final FS report was provided to allow review of the requested groundwater treatment alternative and other changes to the Draft Final FS. We are preparing a second redline to document the changes identified in the attached response and will be issuing it as an electronic submittal in advance of the Final FS report for this site.

If you have any questions regarding this submittal, please do not hesitate to contact me at 978-474-8434, or Mr. Roberto Pagtalunan at (757) 341-2010.

Very truly yours,

Stephen S. Parker, LSP
Project Manager

Enclosures

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PART 1:
NAVY RESPONSES TO USEPA COMMENTS
REDLINE DRAFT FINAL FEASIBILITY STUDY REPORT
DECISION UNIT 4-1 AT SITE 12 – TANK FARM 4
NAVAL STATION NEWPORT, RHODE ISLAND
COMMENTS DATED MARCH 24, 2013

GC1: Regarding bioprecipitation, EPA notes that the solubility of MnS in water is reportedly approximately 4.7 milligrams per liter (mg/L) and that MnS is not nearly as insoluble as many other metal sufides (refer to solubility product constants). Consequently, most other metals present will precipitate as sulfides before manganese, including iron, and will act as a sink for the sulfide generated. Assuming sufficient sulfide is generated to precipitate MnS, subsequently, when the sulfide ion concentration in the flushing water decreases, manganese will desorb back into the groundwater. At normal groundwater geochemical conditions in the absence of contamination the sulfide concentration would not remain great enough to prevent desorbed manganese from becoming problematic. Based on this, it is not apparent that the proposed groundwater treatment option would be successful at Tank Farm 4. Please explain why oxidation should not be used to return the ORP to natural conditions and precipitate MnO2 and complexes that are very insoluble.

Response: As presented in the FS report, geochemical conditions at the site indicate that past releases of petroleum to the subsurface at and upgradient of DU 4-1 are indirectly causing elevated concentrations of metals in groundwater at the Site. The conceptual model suggests that the residual petroleum in the subsurface is being degraded by bacteria present naturally in the subsurface during respiration processes. Respiration requires the presence of an electron acceptor, which will be 'reduced' as it accepts the electron. Terminal electron acceptors include, in order of use in the environment; oxygen, nitrate, manganese/iron, sulfate and carbon dioxide. As petroleum degradation progresses, the dissolved oxygen present in the subsurface lowers in concentration and the ORP becomes lower/more negative. Dissolved oxygen at TF4 was measured between 0.12 – 0.85 mg/l and ORP was measured between -42.8 - +167 mV. The values of these parameters indicate a low oxygen environment where reducing conditions dominate.

When manganese and iron are reduced, they become soluble and relatively high concentrations of these metals can be measured in the groundwater. The Navy has identified this as a likely explanation for the elevated metals concentrations seen in the subsurface at TF4, particularly of manganese and iron. There is no classic 'source area' to target to lower the concentrations of metals in the groundwater at the site, their concentration generally depends on the localized geochemical environment, which is presumably being influenced by the natural bacterial degradation of petroleum compounds both at and upgradient of DU 4-1.

The situation at DU 4-1 is not the typical situation when it comes to the remediation of metals; there is not a source area, plume, or a concentration that is orders of magnitude greater than what occurs in nature. In-situ chemical injection programs designed to neutralize inorganics are typically implemented at sites where inorganic concentrations are magnitudes of order higher than what are currently measured at the site. Vendors warn that concentrations measured at DU 4-1 are likely to rebound after treatment and such treatment may not be effective in the long term. Rebound is expected to occur when geochemical conditions (DO, ORP, pH, etc.) return to their former state,

thereby bringing the solid precipitates back into solution.

The Navy's interpretation of the EPA's comments is that the EPA has presented two objections to this proposed remedial alternative; 1) is that other metal sulfide precipitation (especially iron sulfides) will interfere with manganese sulfide precipitation, and 2) that the manganese will return to solution when the groundwater environment is depleted in sulfite. The Navy offers the following in explanation:

1) The Navy agrees that there would be interference from other metals, especially iron, in sulfide precipitation. However, iron and other metals would also interfere in the same way if the system was artificially oxidized to encourage oxide precipitation, as proposed by the EPA. The Navy is not aware of any technology that can isolate the manganese for treatment without any interference from the other metals.

2) The Navy has presented a remedial option, GW3, which encourages sulfate-reducing bacteria to grow and reduce sulfate into sulfite. The groundwater environment is currently a reducing environment and this treatment seeks to enhance the current conditions in the groundwater system by encouraging sulfate reduction. The EPA is suggesting oxygenating the system, effectively trying to change the groundwater environment from its current reducing environment to an oxygenated one. Both scenarios are attempting to change current conditions to encourage precipitation. Both scenarios are at a risk of not being a permanent solution if groundwater was to return to its current state. The Navy is unaware of a permanent treatment solution in this case. Iron and manganese are usually treated ex-situ, immediately prior to consumption, because of these difficulties.

Alternative GW3 was presented because of its potential to remove manganese from its soluble state and decrease the concentration of manganese in groundwater and because it considers the sensitivity of the wetland environment by trying to enhance bacteria already present in the subsurface instead of injecting extremely reactive chemicals into the subsurface.

Both EPA and RIDEM have presented valid concerns in reference to remedial option GW3. However, any in – situ treatment alternative has similar concerns. The Navy understands, and has expressed to both RIDEM and EPA that there are significant uncertainties with treatment of groundwater in situ for metals at the concentrations present and from the apparent sources. GW3 was presented as an option for treatment in the feasibility study for DU 4-1, and given the uncertainties with its potential for long term success, the Navy will not likely propose to use it at the site. If, however, this remedial alternative is selected at some point in the future, an in-depth geochemical evaluation will be necessary to provide further information to evaluate the effectiveness of GW3, prior to implementation. This information will be provided in the appropriate portions of Sections 3 and 5 of the revised FS.

GC2: The scope and objective of groundwater remediation for DU 4-1 needs to be clarified. Please refer to the detailed comment regarding GW3 on page 5-5, Section 5.1.3.

Response: Please refer to the responses to comments GC1 above, and 46 below.

1. p. ES-1, ¶1 *At the end of the last sentence, add: "under State regulatory oversight. All remaining petroleum in the soil/groundwater onsite continues to be regulated under State authority.*

Response: The suggested revision will be made.

2. p. ES-2, ¶1 *The term "DU" is not a CERCLA term. If the fence is going to be a component of the remedy (including part of the LUCs), the LUCs to address soil lead contamination need to be retained as part of OU11. The appendices for this OU 11 document need to include the analytical results for the fenceline (Tables 7-59 through 7-56). Please use the following replacement text for this paragraph: "Elevated lead levels in soils associated with the Site fence were also identified. These soils will be included as a component of fence operation and maintenance as part of the soil alternatives in the FS. Any further remediation for lead-contaminated soil that may be required will be addressed in a future CERCLA decision document."*

Response: The fence is not a component of the remedy. The following text will be used in place of the above suggestion: "Elevated lead levels in soils associated with the Site fence were also identified, and associated with the fence. These soils will be addressed through a fence maintenance action managed by the Naval Station and not a part of CERCLA."

3. p. ES-2, *last bullet Please explain why a PRG for arsenic was not developed since it is identified as a groundwater risk driver for both a cancer and non-cancer. In the "Groundwater PRG" section on page 2-8, arsenic is identified as a COC, but there is no discussion why a PRG was not developed for it.*

Response: The cited text states: "Although arsenic contributed to risk from groundwater, a PRG was not selected because concentrations were below the EPA maximum contaminant level (MCL)." This will be added to Section 2.2.2.

4. p. ES-3, ¶1 *Replace the first sentence with: "The FS identifies that an additional seven groundwater monitoring wells may be installed as part of the implementation of groundwater alternatives."*

Response: The suggested revision will be made.

5. p. ES-3, ¶3 *Regarding the new SO3 text, can the Navy include the potential percentage change in the cost of the alternative with the added volume removed? Will the increased cost still fall within the acceptable +50 to – 30% range for estimating alternative costs?*

Response: The text will be revised to state "the quantity of soil change pending results of the pre-excavation sampling program is expected to fall within the acceptable +50 / -30% range for estimating alternative costs under CERCLA".

6. p. ES-4 *In the GW-3 text, remove everything after the first sentence. This section describes the alternative. None of the other alternative descriptions includes any analysis of the viability of the alternative.*

Response: The cited text will be moved to Section 5.1.3.

7. p. 1-2, ¶1 *Insert the following footnote in the last sentence after "in soil:" "Elevated lead levels in soils associated with the Site fence were also identified. These soils will be included as a component of fence operation and maintenance as part of the soil alternatives in the FS. Any further remediation for lead-contaminated soil that may be required will be addressed in a future CERCLA decision document."*

Response: The fence is not a component of the remedy. The following text will be used in place of the above suggestion: "Elevated lead levels in soils associated with the Site fence were also identified, and associated with the fence. These soils will be addressed through a fence maintenance action managed by the Naval Station and not a part of CERCLA."

8. p. 1-11, §1.6 *Identify whether any coastal floodplain or floodplain associated with Normans Brook is present within the Site.*

Response: The following will be stated: "Portions of the site associated with Normans Brook are within the 100 year flood zone (Zone AE) as defined by FEMA (FIRM map 44005C0083H)".

9. p.1-13, §1.7 *The additional language on dioxin/furan is not sufficient. Since the finalization of EPA's Volume 1 Non-Cancer Dioxin Reanalysis in February 2012, a new non-cancer reference dose value is available to calculate site-specific risks for dioxin. Since the DGA and previous Draft FS were completed before this release, an acknowledgement of this new value and a qualitative assessment of its impact on dioxin risks at the site need to be provided in the FS. If there is any change to the dioxin risks that cause dioxin to be considered as a COC, then risk-based PRGs for dioxin would need to be calculated using the new reference dose value.*

Response: The hazard indices for dioxins/furans presented in the human health risk assessment (HHRA) were calculated using an oral reference dose of 1E-9 mg/kg/day, which was obtained from the Agency for Toxic Substances and Disease Registry (ASTDR). In February 2012 USEPA published a new value oral reference dose in the Integrated Risk Information System (IRIS). The new oral reference doses of 7E-10 mg/kg/day is slightly more toxic than the value used in the HHRA. The new reference dose for dioxins/furans does not change the conclusions of the HHRA. As can be seen from the table below, hazard indices calculated using the new oral reference dose are orders of magnitude less than the acceptable level of 1. This information will be included in Section 1.7 in place of the previous redline text.

HAZARD INDICES FOR EXPOSURES TO DIOXINS/FURANS
TANK FARM 4 AND 5
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Receptor	Tank Farm 4		Tank Farm 5	
	Surface Soil	All Soil	Surface Soil	All Soil
Construction Workers	0.008	0.007	0.01	0.01
Industrial Workers	0.005	0.005	0.007	0.007
Adolescent Trespassers	0.002	0.002	0.002	0.002
Child Recreational Users	0.008	0.007	0.01	0.01
Adult Recreational Users	0.0009	0.0008	0.001	0.001
Child Residents	0.06	0.05	0.08	0.08
Adult Residents	0.007	0.006	0.009	0.009

Hazard indices were calculated using an oral reference dose (RfD) of 7E-10, a reference concentration (RfC) of 4E-8, and the exposures assumptions from
the HHRA presented in the RI report for Tank Farm 4 and 5.

10.p. 1-15, ¶2 *To be consistent with earlier discussions in the text (such as in the first paragraph of page 1-2), add iron as a COC for groundwater.*

Response: The suggested revision will be made.

11. p. 1-16, ¶2 *Discuss iron in the groundwater.*

In the sixth sentence, replace "considered informal technical guidance for unregulated drinking water contaminants" with "EPA guidance for developing risk-based standards for drinking water contaminants that do not have promulgated standards within either federal or state drinking water regulations."

In the seventh sentence, replace "However, there were no exceedances of EPA Maximum Contaminant Levels (MCLs), nonzero Maximum Contaminant Level Goals (MCLGs), federal risk-based standards, or more stringent state groundwater standards" with "None of the contaminants identified in Site groundwater exceed EPA Maximum Contaminant Levels (MCLs), nonzero Maximum Contaminant Level Goals (MCLGs), or more stringent state groundwater standards."

Response: The suggested revisions will be made.

12. p. 2-4, ¶1 *At the end of the last sentence, add: ", although contaminants in the groundwater exceed federal risk-based standards that were developed using To Be Considered EPA guidances identified in Section 2.1.4.4, below."*

Response: For clarity, the following will be stated ", although manganese in the groundwater exceeds the EPA health advisory which is identified as a To Be Considered (TBC) EPA guidance, described in Section 2.1.4.4, below."

13. p. 2-8 *In the "Groundwater PRG" section, please explain why no PRG was developed for arsenic even though it was identified as a COC.*

Response: The cited text will be revised to state: "Although arsenic contributed to risk from groundwater, a PRG was not selected because concentrations were below the EPA maximum contaminant level (MCL)."

14. p. 2-12, ¶4 *Remove the last sentence.*

Response: The suggested revision will be made.

15. p. 2-13, ¶2 *In the Executive Summary and earlier in the text, iron is identified as a COC in groundwater, but this section does not support that determination.*

Response: Missing from the first paragraph on Iron is that the RME risk from iron to the child resident via future potable use of groundwater is demonstrated by an HQ=2. This will be added to the cited section.

16. p. 2-14 *Remove the last sentence in the first manganese paragraph.*

Response: The suggested revision will be made.

17. p. 2-17, §2.4.1 *The last full paragraph refers to a threshold value of 43 mg/kg for arsenic in the RI Remediation Regulations. Please explain what this refers to in the text.*

Response: The threshold value of 43 mg/kg for arsenic in soil is cited in RIDEM remediation regulations Section 12.04 C. This will be clarified in the cited section.

18. p. 2-18, §2.4.1 *Please edit the third sentence in the first full paragraph to read: "… at this time (only TPH data are available to indicate that they may contain COCs above PRGs), …."*

The last sentence in the second full paragraph states that an estimate of soil volume exceeding future industrial use follows, but the subsequent text discusses residential exceedances. Please correct or reorganize the subsequent text as appropriate.

Response: The suggested revisions will be made. The volumes cited are those exceeding industrial PRGs.

19. p. 3-8, ¶2 *The text on fencing should discuss maintenance of the existing fencing, as well as installation of new fencing.*

Response: The discussion on fencing will be revised to note that maintaining fencing is necessary if selected as an element of the remedy.

20. p. 3-8 *In the first Fencing bullet, at the end of the last sentence, add: "as long as soil management procedures are followed in areas where soil exceeds risk levels for soil contaminants."*

Response: The suggested revision will be made.

21. p. 3-8 *In the first Signs bullet, at the end of the last sentence, add: "as long as soil management procedures are followed in areas where soil exceeds risk levels for soil contaminants."*

Response: The suggested revision will be made.

22. p. 3-9 *In the last sentence of the last paragraph, replace "EPA request" with "regulatory standards."*

Response: The statement will be revised as follows: "However, because the source of these metals is uncertain, and to assure compliance with both the soil and groundwater RAOs, groundwater monitoring is retained as a component of soil remedial action alternatives to assure compliance with leachability criteria".

23. p. 3-16, §3.4 *Please remove groundwater monitoring from the "Removal" general response action in the table at the top of this page. As the text states on page 3-12, bulk excavation is the only soil removal action considered.*

Response: The suggested revision will be made.

24. p. 3-18, §3.4.2 *Please edit the last sentence under Groundwater Monitoring to read: "… as a component for use with other remedial options."*

Response: The suggested revision will be made.

25. p. 3-18 *In the fourth sentence of the last paragraph, insert "arsenic," after "manganese." Arsenic is identified as a COC.*

Response: Because site concentrations already meet the PRGs for arsenic in groundwater, it would not be part of the MNA program.

26. p. 3-20, ¶2 *In the Conclusion text, add "arsenic."*

Response: Because site concentrations already meet the PRGs for arsenic in groundwater, it would not be part of the MNA program.

27. p. 3-24, §3.4.6 *Please correct this table to include Groundwater Monitoring as a Limited Action option and to delete LUCs and Inspections and Long-term Monitoring from the Treatment category. These are not treatment options. They are limited action options that could be implemented concomitant with a treatment option.*

Response: The suggested revision will be made.

28. p. 3-26, §3.5 *Figure 1-3 does not show that there is a fence along the western boundary of Tank Farm 4. If there is no fence on the western boundary, then the site would be accessible to trespassers even with LUCs in place and recreational use would not be restricted. Please either edit the scope of Alternative SO3 to inhibit unrestricted use (fences and signs), or correct Figure 1-3 and other figures if a fence exists.*

Response: There is no fence on the west boundary of Tank Farm 4 or DU 4-1. Access & use is restricted by signs and vehicle gates, and is patrolled by NAVSTA security. Thus it is not an unrestricted use site. It is acknowledged that the site is open to trespass, but there is no risk to trespassers as identified in Table 6-32 of the Data Gaps Report. No change is necessary based on this comment.

29. p. 4-2, ¶2 *At the end of the second sentence, add: "and to identify and prevent disturbance of components of the remedy (including fencing and monitoring wells)."*

Response: The suggested revision will be made.

Add a new fourth sentence: "LUCs would also restrict disturbance of elevated lead contaminated soils associated with the Site fence until they are addressed in a future decision document."

Response: Lead in soil near the fence is not part of this decision unit.

In the sixth sentence, insert "or fencing/signage installation/maintenance" after "construction activities."

Response: The sentence will be revised to state: "…construction activities (including fencing, signage, monitoring well installation)..."

30. p. 4-3, §4.1.2 *The third full paragraph should refer to existing and new fence, not just existing fence, because the new fence is required to prevent industrial user access.*

Response: The new fence would prevent industrial and restricted recreational user access to the target areas. There is no existing fence that needs maintenance as part of this remedy.

The discussion under Fencing and Signs needs to recognize the need for a complete perimeter fence to prevent unauthorized and unrestricted access to the site.

Response: There is no need for a complete perimeter fence under this alternative. Access & use is restricted by signs and vehicle gates, and is patrolled by NAVSTA security. LUCs would continue these restrictions. It is acknowledged that the site is open to trespass,

but there is no risk to trespassers as identified in Table 6-32 of the Data Gaps Report. No change is necessary based on this comment.

31. p. 4-4, §4.1.3 *The "Removal of Target Area Soil" text should explain the cleanup goal of the removal (i.e., remove all soil exceeding industrial PRGs). It also should clarify whether soil exceeding either industrial or residential standards will remain in the subsoil below the excavation layer. If so, the text should clarify if the clean soil used to fill the excavated areas will serve as a cover requiring LUCs, monitoring, and O&M to contain the contaminated subsurface soil.*

Response: New text will be added to the first sentence of the "Removal of Target Area Soil" paragraph: "The goal of the target area removals is to remove soil (and debris) specific to each target area as described in the following paragraphs. Following these removals, subsurface soil remaining after backfill may exceed residential and / or industrial PRGs for arsenic and manganese, and therefore LUCs, monitoring and inspections (also described below) will be required to complete the remedy."

32. p. 4-4, ¶5 *This paragraph should be simplified. If the 15 mg/kg Site-specific background number was approved, that is the background number, not a "target number." Please revise the PRG based on a background of 15 mg/kg. Table 2-4 and Section 2.2.2.2 should be revised accordingly.*

Response: The 15 mg/kg number was an agreement between RIDEM and the Navy. No change is necessary.

33. p. 4-5, §4.1.3 *The third full paragraph refers to one test pit west of SB92. Elevated concentrations of TPH were detected in two or three of the test pits. Areas in and around the test pits with elevated TPH concentrations need to be sampled as mentioned previously.*

Response: The fourth paragraph on Page 4-5 will be revised as follows: Additionally, the "debris berm" identified in Section 2.4.1 of this report would be evaluated and removed if solid waste is found within it, and a former test pit west of SB924 would be sampled. The Former Test pit area would be sampled for COCs to determine if PRGs are exceeded in soil, and for TPH at regulatory request. If PRGs are exceeded, additional target excavations may be conducted accordingly using the PRGs to direct the actions. Post excavation sampling would be conducted following removal of soils from target areas to confirm that the remedial action has met the remediation goals. Post excavation sampling will include TPH by regulatory request.

34. p. 4-5, §4.1.3 *The discussion under LUCs and Inspections refers to a partial fence as part of the SO3 remedy. Because institutional controls do not prevent unauthorized unrestricted recreational use of the site, a complete fence is needed as a remedial component. Please revise the alternative to include that.*

Response: The use of partial fencing under alternative SO3 is not needed, and will be deleted.

In the first paragraph, at the end of the second sentence, add: "and to identify and prevent disturbance of components of the remedy (including fencing and monitoring wells)."

Response: This revision will be made.

Add a new fourth sentence: "LUCs would also restrict disturbance of elevated lead contaminated soils associated with the Site fence until they are addressed in a future decision document."

Response: Please refer to comment 2, above

Remove the last sentence. The soil PRGs are based on more stringent state standards (that are within EPA's risk range).

Response: This revision will be made.

Discuss whether LUCs are required to maintain the depth of clean cover within the excavated areas (e.g., a minimum thickness of cover is required by regulatory standards in order to be able to leave contaminated subsurface soils in place).

Response: Because subsurface soil still exceeds industrial PRGs for arsenic and manganese, the surface soil will need to remain uninterrupted in areas (Figures 2-6 and 2-10) and the LUCs will be required to protect this cover. This will be clarified in the cited section.

35. p. 4-7, §4.1.3 *The partial paragraph at the top of the page should refer to existing and new fence, not just existing fence because the new (perimeter) fence is required to prevent unauthorized and unrestricted access to the site. In the beginning of the first partial sentence, insert "and operation and maintenance" before "activities."*

Response: A new perimeter fence will not be required under SO3.

36. p. 4-9, §4.2.2 *After the first sentence of the second paragraph, insert: "LUCs will also identify and prevent disturbance of components of the remedy (including fencing and monitoring wells). LUCs would also restrict disturbance of elevated lead contaminated soils associated with the Site fence until they are addressed in a future decision document."*

Response: The sentence will be revised as follows: "LUCs will also identify and prevent disturbance of components of the remedy (including any necessary fencing, signs and monitoring wells).

37. p. 4-10, ¶4 *In the second sentence, replace "not all of the" with "no."*

Response: This revision will be made.

38. p. 4-11, §4.2.3 *Incorporate previous comments about Alternative SO-3. Institutional controls do not prevent unauthorized unrestricted recreational use of the site, a complete fence is needed as a remedial component. Please revise the alternative to include it.*

Response: A new perimeter fence will not be required under SO3.

The description of the required LUCs need to include identifying and preventing disturbance of components of the remedy (including fencing and monitoring wells)."

Response: This revision will be made.

LUCs also are needed to restrict disturbance of elevated lead contaminated soils associated with the Site fence until they are addressed in a future decision document.

Response: The perimeter fence is not part of the selected remedy.

The summary needs to discuss whether LUCs are required to maintain the depth of clean cover within the excavated areas (e.g., a minimum thickness of cover is required by regulatory standards to contain contaminated subsurface soils).

Response: This revision will be made.

39. p. 4-12, ¶4 *Remove this paragraph if it is referring to potential treatment of contaminated material offsite. If onsite, add more detail in the FS regarding incorporating onsite treatment as a component of this alternative.*

Response: The discussion of offsite treatment will be removed at the commenters suggestion.

40. p. 4-14, ¶1 *In the first partial sentence, insert ", protect components of the remedy," after "uncontrolled excavation."*

Response: This revision will be made.

41. p. 4-14, ¶5 *Remove the last sentence. The FS identified that LUCs are required for SO3.*

Response: This revision will be made.

42. p. 5-1, §5.0 *To comply with EPA's earlier comments regarding this alternative, please supplement the text at the end of the section to read: "If after ten years of monitoring a statistically significant decreasing trend in the metals COCs cannot be demonstrated, the Navy shall modify the remedy in consultation with EPA and RIDEM to implement an active treatment remedy, such as GW-3, to complete the remedial action for groundwater at the site."*

Response: The following will be added as determined through response to RIDEM comments and the discussions held 4/4/13: "The amount of time to achieve groundwater cleanup goals with MNA is as yet uncertain; however, the time required will be reevaluated at each five year cycle, at a minimum, to assure that the remedy remains acceptable."

43. p. 5-2, ¶4 *See previous comments questioning why arsenic was identified as posing both a cancer and non-cancer risk in groundwater, but no PRG was developed. Arsenic is the only contaminant that was identified as posing a cancer risk.*

Response: Please refer to comments No. 3 and 13 above.

44. p. 5-3, ¶2 *Explain why monitoring for arsenic is not required.*

Response: Please refer to comments No. 3 and 13 above.

45. p. 5-3, ¶3 *LUCs need to be established to protect components of the remedy (i.e., monitoring wells).*

Response: This revision will be made.

46. p. 5-5, §5.1.3 *Regarding the second full paragraph, please clarify the treatment objective. The conceptual site model states that petroleum releases at the upgradient tank farm have likely caused the dissolution of metals into groundwater that is impacting DU 4-1. Based on historical analytical data this is likely correct, but there is also evidence of releases within DU 4-1 that have exacerbated the problem. The extent of the Navy's proposed treatment locations upgradient of the two ruin locations will not be sufficient to treat all the contaminated groundwater migrating into DU 4-1 from the upgradient tank farm. Analytical data from the Tank Farm 4 RI indicate that elevated metals concentrations existed throughout the tank farm, indicating that a very large plume of contaminated groundwater exists at Tank Farm 4 and that the limited treatment locations proposed would not be an effective remedial solution. Please clarify what the groundwater treatment objective is for DU 4-1. It appears that the only way that groundwater at DU 4-1 can be returned to beneficial use is to restore groundwater throughout Tank Farm 4 to beneficial use.*

Response: The comment is noted. There is high uncertainty as to the success of the GW2 remedy over time. The GW3 remedy also has a high uncertainty of success, but was added at EPA's request. Prior to implementation of GW3, a detailed geochemical evaluation would be necessary, at which time the treatment zones may be modified. The treatment zones presented in the cited section are adequate for evaluation of the alternative in the FS.

Please review the discussion in the last paragraph. It is not apparent that PRGs would be achieved within one year after full injections are completed based on a flushing time of fifteen years for one pore volume in overburden. Contaminated groundwater upgradient of the treatment zone would continue to migrate through the former treatment zone and into DU 4-1 after treatment ceased.

Response: The observation is correct and the comment is noted. There is high uncertainty as to the success of the GW3 remedy over time.

47. p. 5-6, §5.1.3 *Please correct the discussion in the first paragraph regarding the monitoring period. If the first and second injections occur two years apart, presumably a minimum monitoring period following the second injection would be two years. This presumption is validated by the last sentence in this paragraph that calls for four years of quarterly monitoring. Based on this, the second sentence should be rewritten because it is not consistent with four years of quarterly monitoring.*

Response: The cited paragraph will be revised for clarity on two injection periods, and four years of monitoring. However, if additional discussions and comments above indicate that quarterly monitoring should continue for a longer period, then the discussion will be revised to reflect that.

48. p. 5-6, §5.1.3 *As written, the discussion in the second paragraph regarding the upgradient oxidation-reduction conditions is unclear because of the qualifying phase "… if petroleum degradation*

is continuing…." The ORP required to reduce sulfate to precipitate metal sulfides is much lower than the ORP created by the biodegradation of the petroleum. The higher oxidizing conditions in the upgradient groundwater would cause a reversal of the precipitation of MnS. Please clarify.

Response: The comment is noted, and the observation is correct. There is high uncertainty as to the success of the GW3 remedy over time.

49. p. 5-6, §5.1.3 *The discussion under Long-Term Monitoring states that 26 years of annual monitoring would be conducted following treatment and four years of quarterly monitoring. This is not appropriate for a treatment alternative. If treatment has not achieved the remedial objectives, additional treatment should be performed or another treatment option should be implemented to eliminate long-term monitoring. If upgradient conditions do not change over time, additional upgradient treatment would be warranted. This alternative should not have 30 years of monitoring in the remedy. Please revise the scope of this alternative.*

Response: The comment is noted. There is high uncertainty as to the success of the GW3 remedy over time, and continued monitoring under the GW3 alternative is appropriate given this uncertainty.

50. p. 5-6, §5.1.3 *In the fourth paragraph, LUCs need to be established to protect components of the remedy (i.e., monitoring and injection wells).*

Response: This revision will be made.

51. p. 5-10, §5.2.2 *Regarding the partial paragraph at the top of the page, EPA questions whether MNA could be confirmed with two years of quarterly monitoring. If after five years a trend cannot be confirmed, an alternative remedy needs to be considered and after ten years a treatment remedy may need to be implemented.*

Response: The observation is correct. MNA should be continued for a period necessary to establish a statistical trend. A minimum of 8 years is anticipated. This may require discussion with RIDEM, and if possible the revision will be made accordingly.

In the second sentence of the seventh paragraph, insert "and monitoring well installation/maintenance" after "groundwater sampling."

Response: This revision will be made.

52. p. 5-12, §5.2.2 *In the second sentence of the fifth paragraph, change "and groundwater sampling" to ", groundwater sampling, and monitoring well installation/maintenance".*

Response: This revision will be made.

53. p. 5-13, ¶3 *Delete this paragraph because environmental sustainability is not discussed for any of the other soil or groundwater alternatives.*

Response: This revision will be made.

54. p. 5-14, §5.3 Please add GW3 to the discussion of Overall Protection.

Response: This revision will be made.

55. p. 5-14, §5.3 Change the text of the second ARARs paragraph (that continues to the next page) to: "Applicable chemical-specific ARARs identified in this FS are already met for the groundwater. However, federal risk-based standards developed using To Be Considered guidance are not met for the identified groundwater COCs for GW-1. These risk-based standards will eventually be achieved under both GW-2 and GW-3. It is expected that the treatment system used in GW-3 will achieve PRGs within a significantly shorter period of time (4 years – although the reduction might not be permanent) than the GW-2, MNA only, alternative (45 years)."

Response: The statement will be revised as follows: "Applicable chemical-specific ARARs identified in this FS are already met for the groundwater. However, the EPA health advisory which is identified as a To Be Considered (TBC) EPA guidance criterion, is not met for manganese under GW-1. The criterion will eventually be achieved under both GW-2 and GW-3 based on predicted geochemical changes. It is expected that the treatment system used in GW-3 will achieve PRGs within a significantly shorter period of time (4 years – although the reduction might not be permanent) than the GW-2, MNA only, alternative (45 years)."

56. p. 5-15, §5.3 The discussion of GW2 under Long-Term Effectiveness needs to recognize that the time to achieve the remedial goals is uncertain (it is expected to take much longer than estimated). Consequently, additional treatment beyond GW2 may be required to effect a change in the COC concentrations if GW2 does not produce progress within a reasonable time.

Response: It should be understood within the framework of CERCLA, that if a remedy is not successful, it will be identified at the five year review cycle, and then another remedy can be selected through an ESD or ROD revision. It doesn't need to be cited within the alternative descriptions.

57. p. 5-15, §5.3 Please supplement the Short-Term Effectiveness discussion for GW2 and GW3 to include impacts to site workers and the community.

Response: This revision will be made.

58. p. 5-15, §5.3 Please supplement the discussion under Implementability for GW2. Just as further study is required to map groundwater flow and geochemical conditions for GW3, it would also be necessary for GW2 to determine where additional monitoring points should be located and to establish baseline conditions for MNA.

Response: The Implementability section will be augmented with a statement that for GW2, a design step will be needed to determine appropriate monitoring points and parameters.

59. Table 2-3, p.1 Add federal underground injections standards for GW-3:

Underground Injection Control (UIC)	40 C.F.R. §§ 144, 146, and 147.2000	Applicable	These regulations address the discharge of wastes, chemicals or other substances into the subsurface. The federal UIC program designates injection wells incidental to aquifer remediation as Class V wells.	These regulations apply to underground injection of treatment substances..

60. Table 2-3, p.3 Add state underground injections standards for GW-3:

Injection Control Regulations	Underground Injection Control Program Rules and Regulations	Applicable	Establishes a State Underground Injection Control Program consistent with federal requirements to preserve the quality of the groundwater of the state.	These regulations apply to underground injection of treatment substances.

61. Table 3-2, p. 5 Based on the conceptual model described in this FS, the description and screening comment for Biological needs to be reconsidered because inorganic contaminant concentrations are indirectly affected by removal of organics. The conceptual model is that organic contamination degrades and therefore alters the geochemistry that can mobilize metals. Once organic contaminants have been degraded, the geochemistry should return to natural conditions and metal mobilization will significantly reduce. Please revise this process option to be site-specific and retain it.

Response: The comment is noted. Bioprecipitation is retained as a representative process option for biological treatment.

Similarly, chemical oxidation can be indirectly effective for the same reason, but can also be directly effective by altering the geochemistry and creating metal oxides. Manganese dioxide is much less soluble than manganese sulfide. Please revise this process option to be site-specific and retain it.

Response: Chemical oxidation is not anticipated to be effective based on discussions held with vendors providing these services.

62. Table 3-3, p. 1 If an engineered clean soil cover is required to prevent exposure to subsurface contaminated

soils under SO-3, include the "Permeable Cover" as "Containment."

Response: This revision will be made.

63. Table 3-4 *This table does not contain all the retained technologies. Please either add those that are missing or revise the title. Add a note indicating that only selected representative technologies from those retained are included. Consider supplementing this table based on the comments on Table 3-2.*

Response: This revision will be made.

64. Table 4-1 *For SO-2 and SO-3, at the end of the LUC bullet, add: "prevent exposure to soil contaminants, and to protect components of the remedy."*

Response: This revision will be made.

65. Table 4-8, p. 2 *At the end of the "Action to be Taken" text for the RI Remediation Regulations (if applicable to the alternative), add: "A soil cover of at least xx feet will be maintained to comply with regulatory standards to prevent exposure to contaminated subsurface soil."*

Response: This revision will be made, though for clarity, the statement will end with "exposure to soil containing arsenic and manganese above PRGs".

66. Table 4-11 *Please change reliability of SO3 to "Most Reliable" because of the removal of contaminated soil.*

Response: This revision will be made.

67. Table 5-1 *For GW-2 and GW-3, in the LUC bullet after "site groundwater," insert "and to protect components of the remedy."*

Response: This revision will be made.

GW-3 also should include "Monitoring to determine the effectiveness of the treatment."

Response: This revision will be made.

68. Table 5-2, p. 2 *For the Health Advisory "Action to be Taken" text, add at the end: "There are no actions for this alternative, so unacceptable risk remains."*

Response: This revision will be made.

The RI Remediation Regulations are "Applicable."

Response: This revision will be made.

69. Table 5-5 *This table states that MNA will achieve PRGs within a reasonable time frame. The Navy*

has not demonstrated that with the information provided.

Response: The comment is noted. No changes will be made based on this comment.

70. Table 5-5, p. 2 The RI Remediation Regulations are "Applicable."

Response: This revision will be made.

71. Table 5-7, p.1 Add EPA's MNA Guidance to the Federal section:

Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites	OSWER Directive 9200.4-17P (April 21, 1999)	To Be Considered	EPA guidance regarding the use of monitored natural attenuation for the cleanup of contaminated soil and groundwater. In particular, the guidance explains that a reasonable time frame for achieving cleanup standard though monitored attenuation would be comparable to that which could be achieved through active restoration.	MNA is expected to take approximately 45 years to achieve groundwater cleanup standards. Although this is significantly longer than the GW-3 treatment alternative, there are a number of technical issues regarding GW-3 that may alter its effectiveness. If after five years a trend showing MNA cannot be confirmed, an alternative remedy will be considered and after ten years without sufficient contaminant reductions a treatment remedy may be implemented.

72. Table 5-8, p. 3 The RI Remediation Regulations are "Applicable."

Response: This revision will be made.

73. Table 5-10, p. 2Add state underground injection standards:

Injection Control Regulations	Underground Injection Control Program Rules and Regulations	Applicable	Establishes a State Underground Injection Control Program consistent with federal requirements to preserve the quality	These regulations apply to certain substances that may be included in the injected nutrient mix that will be used to enhance bioprecipitation. The design step will adhere to these regulations as the injected material mix is

			of the groundwater of the state.	determined.

Response: This revision will be made.

74. Table 5-11, p.1 *For GW2, Reduction of Toxicity, Mobility, or Volume Through Treatment: all categories should be designated as "Not Applicable" because GW2 is not a treatment remedy.*

Response: This revision will be made.

For GW3, please correct the entries for Reduction of Toxicity, Mobility, or Volume Through Treatment: Yes, Yes, Yes, Precipitated Metals.

Response: This revision will be made.

For both GW2 and GW3, the Time Until RAOs Achieved is not credible because of the upgradient conditions that will continue to impact DU 4-1 until the upgradient contamination is remediated.

Response: The comment is noted. The effectiveness of the GW2 alternative will be evaluated on a five year basis to determine if it is effective in meeting the RAOs. There is high uncertainty as to the success of the GW3 remedy over time.

75. Figure 1-4 *To be consistent, please either delete the reference to SB 934 or also identify high arsenic at SB943, and potential contamination at the area near SB924 and the waste berm.*

Response: The descriptor for SB 934 will be removed, though the label will remain. Similar labels will be added for SB 943, SB 924 and the "Berm Area".

76. Figures 2-3 Thru 2-6 *The figures show exceedances of the arsenic PRG that in Table 2-6 was set at MCL level of 10. The text erroneously states there are no exceedances of MCLs for arsenic.*

Response: The reviewer appears to have transposed the PRGs for Soil (19 and 24 mg/kg) and the PRG for water (10 ug/L - which is the MCL). There are no MCL exceedances of arsenic in groundwater, and no change is required for this comment.

77. Figure 4-1 *This figure shows the "hot spot" removal area, but there is no "hot spot removal" for alternative SO-2. Please differentiate between the area requiring residential restrictions and the areas requiring industrial restrictions.*

Response: The reviewer is either looking at the wrong figure or looking at the figure from the previous version of the document. The Redline FS Figure 4-1 is correct, showing fence areas as appropriate.

78. Figure 4-2 *This figure should illustrate the additional areas that may be excavated.*

Response: The Berm area and the test pit area west of SB924 will be shown, but not bounded.

79. Add Figures to show the groundwater alternatives, including a LUC boundary for GW-2 and the LUC boundary and treatment area(s) for GW-3.

Response: This revision will be made.

PART 2:
NAVY RESPONSES TO RIDEM COMMENTS
REDLINE DRAFT FINAL FEASIBILITY STUDY REPORT
DECISION UNIT 4-1 AT SITE 12 – TANK FARM 4
NAVAL STATION NEWPORT, RHODE ISLAND
COMMENTS DATED MARCH 22, 2013

1. ***p. ES-4, Executive Summary, GW3.***

Please explain why the Navy selected biodegradation with sulfate-reducing bacteria rather than with oxygen for the groundwater treatment alternative. The use of sulfate-reducing bacteria does not appear to be effective when treating manganese in groundwater. RIDEM suggests that the Navy modify GW3 to an oxidation treatment alternative.

Response: As presented in the FS report, geochemical conditions at the site indicate that past releases of petroleum to the subsurface at and upgradient of DU 4-1 are indirectly causing elevated concentrations of metals in groundwater at the Site. The conceptual model suggests that the residual petroleum in the subsurface is being degraded by bacteria present naturally in the subsurface during respiration processes. Respiration requires the presence of an electron acceptor, which will be 'reduced' as it accepts the electron. Terminal electron acceptors include, in order of use in the environment; oxygen, nitrate, manganese/iron, sulfate and carbon dioxide. As petroleum degradation progresses, the dissolved oxygen present in the subsurface lowers in concentration and the ORP becomes lower/more negative. Dissolved oxygen at TF4 was measured between 0.12 – 0.85 mg/l and ORP was measured between -42.8 - +167 mV. The values of these parameters indicate a low oxygen environment where reducing conditions dominate.

When manganese and iron are reduced, they become soluble and relatively high concentrations of these metals can be measured in the groundwater. The Navy has identified this as a likely explanation for the elevated metals concentrations seen in the subsurface at TF4, particularly of manganese and iron. There is no classic 'source area' to target to lower the concentrations of metals in the groundwater at the site, their concentration generally depends on the localized geochemical environment, which is presumably being influenced by the natural bacterial degradation of petroleum compounds both at and upgradient of DU 4-1.

The situation at DU 4-1 is not the typical situation when it comes to the remediation of metals; there is not a source area, plume, or a concentration that is orders of magnitude greater than what occurs in nature. In-situ chemical injection programs designed to neutralize inorganics are typically implemented at sites where inorganic concentrations are magnitudes of order higher than what are currently measured at the site. Vendors warn that concentrations measured at DU 4-1 are likely to rebound after treatment and such treatment may not be effective in the long term. Rebound is expected to occur when geochemical conditions (DO, ORP, pH, etc.) return to their former state, thereby bringing the solid precipitates back into solution.

RIDEM has suggested that the Navy change the remedial option to treatment by oxidation because '…sulfate-reducing bacteria does not appear to be effective when treating manganese in groundwater'. The Navy would agree that the treatment of manganese and an effective and

permanent decrease in its concentration is not guaranteed by GW3 (as stated in the FS report), but would argue that this is not guaranteed by any treatment option. For the following reasons, treatment by oxidation is just as likely to have complications as the treatment suggested by the Navy:

1) There will be interference from other metals, especially iron, in sulfide precipitation. However, iron and other metals would also interfere in the same way if the system was artificially oxidized to encourage oxide precipitation, as proposed by the RIDEM. The Navy is not aware of any technology that can isolate the manganese for treatment without any interference from the other metals.

2) The Navy has presented a remedial option, GW3, which encourages sulfate-reducing bacteria to grow and reduce sulfate into sulfite. The groundwater environment is currently a reducing environment and this treatment seeks to enhance the current conditions in the groundwater system by encouraging sulfate reduction. RIDEM is suggesting oxygenating the system, effectively trying to change the groundwater environment from its current reducing environment to an oxygenated one. Both scenarios are attempting to change current conditions to encourage precipitation. Both scenarios are at a risk of not being a permanent solution if groundwater was to return to its current state. The Navy is unaware of a permanent treatment solution in this case. Iron and manganese are usually treated ex-situ, immediately prior to consumption, because of these difficulties.

Alternative GW3 was presented because of its potential to remove manganese from its soluble state and decrease the concentration of manganese in groundwater and because it considers the sensitivity of the wetland environment by trying to enhance bacteria already present in the subsurface instead of injecting extremely reactive chemicals into the subsurface.

Both EPA and RIDEM have presented valid concerns in reference to remedial option GW3. However, any in – situ treatment alternative has similar concerns. The Navy understands, and has expressed to both RIDEM and EPA that there are significant uncertainties with treatment of groundwater in situ for metals at the concentrations present and from the apparent sources. GW3 was presented as an option for treatment in the feasibility study for DU 4-1, and given the uncertainties with its potential for long term success, the Navy will not likely propose to use it at the site. If, however, this remedial alternative is selected at some point in the future, an in-depth geochemical evaluation will be necessary to provide further information to evaluate the effectiveness of GW3, prior to implementation. This information will be provided in the appropriate portions of Sections 3 and 5 of the revised FS.

2. ***p. 1-15, Section 1.8, Nature and Extent of Contamination; last paragraph, 1st sentence.***

Please add iron as a COC in groundwater.

Response: The requested change will be made.

3. ***p. 1-16, Section 1.9, Fate and Transport Characteristics of Site Contaminants; 2nd paragraph.***

Please also discuss iron in groundwater in this section.

Response: The requested change will be made.

4. ***p. 2-3, Section 2.1.4.1, Chemical-Specific Applicable or Relevant and Appropriate Requirements, Soil; 2nd paragraph.***

Please update the reference to the RIDEM Remediation Regulations. These regulations were last updated November 2011.

Response: The requested change will be made.

5. ***p. 2-4, Section 2.1.4.1, Chemical-Specific Applicable or Relevant and Appropriate Requirements, Groundwater.***

Please do not delete the 2nd sentence in this paragraph which states that the aquifer at Tank Farm 4 is classified as GA/NA. Instead, please state that although this classification exists, EPA does not recognize this and therefore federal standards apply, except when more stringent state criteria exist. Please revise this paragraph based on the discussion of this same topic for Gould Island during the conference call on April 5, 2013.

Response: The requested change will be made.

6. ***p. 2-9, Section 2.2.3, Applicable or Relevant and Appropriate Requirements and To-Be-Considered Guidance for Preliminary Remediation Goals; 2nd paragraph.***

Please update the reference to the RIDEM Remediation Regulations. These regulations were last updated November 2011.

Response: The requested change will be made.

7. ***p. 3-22, Section 3.4.5, In-Situ Treatment (Bioprecipitation)***

Please refer to comment #1.

Response: Please refer to the response to Comment 1.

8. ***p. 5-4, Section 5.1.3, Alternative GW3.***

Please refer to comment #1.

Response: Please refer to the response to Comment 1.